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End-of-Life Medical Treatment Choices:

Do Survival Chances and Out-of-Pocket Costs Matter?

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Abstract

Background—Out-of-pocket medical expenditures incurred prior to the death of a spouse could deplete savings and impoverish the surviving spouse. Little is known about the public's opinion as to whether spouses should forego such end-of-life (EOL) medical care to prevent asset depletion.

Objectives—To analyze how elderly and near elderly adults assess hypothetical EOL medical treatment choices under different survival probabilities and out-of-pocket treatment costs.

Methods—Survey data on a total of 1143 adults, with 589 from the Asset and Health Dynamics Among the Oldest Old (AHEAD) and 554 from the Health and Retirement Study (HRS), were used to study EOL cancer treatment recommendations for a hypothetical anonymous married woman in her 80s.

Results—Respondents were more likely to recommend treatment when it was financed by Medicare than by the patient's own savings and when it had 60% rather than 20% survival probability. Black and male respondents were more likely to recommend treatment regardless of survival probability or payment source. Treatment uptake was related to the order of presentation of treatment options, consistent with starting point bias and framing effects.

Conclusions—Elderly and near elderly adults would recommend that the hypothetical married woman should forego costly EOL treatment when the costs of the treatment would deplete savings. When treatment costs are covered by Medicare, respondents would make the recommendation to opt for care even if the probability of survival is low, which is consistent with moral hazard. The sequence of presentation of treatment options seems to affect patient treatment choice.

Keywords

End of life care; Medicare; Heuristics and biases; Oncology; Willingness to Pay

INTRODUCTION

Over the last four decades, the poverty rate of the U.S. elderly population has fallen by more than 60%, and the most recent data (2005) show that only about one of every ten people aged 65 and older (3.6 million) earned less than the poverty level.¹ Yet, the poverty rate of elderly widows is three times higher than that of elderly married women.² Recent studies provide

convincing evidence that out-of-pocket health care expenditures incurred prior to the death of a spouse are partially responsible for the impoverishment of the surviving spouse.^{3,4} As much as one fourth of the increase in elderly poverty after widowhood has been attributed to end-of-life (EOL) out-of-pocket health care expenditures.² This added financial burden may also be related to major depression and poorer health outcomes for elderly spousal caregivers.^{5,6,7}

Although out-of-pocket medical expenditures prior to the death of a spouse can drive the surviving spouse into poverty, it is unclear from the literature whether people would and should forego expensive late-life medical care to prevent asset depletion. For example, an altruistic spouse may choose to forego expensive EOL medical care to protect assets in order to shield the widowed spouse from impoverishment or from a decline in living standards after widowhood.

There is also limited research on how individuals respond to changes in prognosis of life-threatening health conditions under different health care financing mechanisms, and on their views as to whether policy choices for various treatment options should depend on prognosis and financing. For example, when would a terminally-ill person agree to forego medical treatment that prolongs survival, and how is this decision modified under different survival probabilities and diverse cost scenarios? Would the same terminally-ill person opt for treatment despite low probability of success just because health insurance coverage results in low out-of-pocket cost?

The purpose of this study is to analyze the various EOL medical treatment choices that elderly and near elderly adults would recommend for a hypothetical elderly woman with cancer, when the treatment choices have varying probabilities of success and substantially different financial implications. To the extent that the recommendations are for a hypothetical person, the choices reflect the respondents' policy choices, rather than choices for themselves.

METHODS

Data Source and Study Population

We used survey data from the Asset and Health Dynamics Among the Oldest Old Study (AHEAD) and the Health and Retirement Study (HRS) - which include identical experimental modules with various vignettes on EOL medical treatment - to study the AHEAD and HRS respondents' expressed recommendations for various hypothetical treatments for cancer. Prior to 1998, the AHEAD and HRS were separate but related surveys. The AHEAD included persons born in 1923 or before, and interviews were conducted in 1993 and 1995. The HRS included persons born from 1931 to 1941 and interviews were conducted in 1992, 1994, and 1996. The two surveys were merged starting in 1998, and are now known simply as the HRS, with interviews every two years since 1998. The vignettes used in our study came from the 1995 AHEAD and the 1996 HRS.

The original HRS included non-institutionalized adults born from 1931 to 1941, who were selected from a nationally representative sample of U.S. households that included oversamples of blacks, Hispanics, and Florida residents, using a multi-stage area probability sample design. The HRS was designed to follow age-eligible individuals and their spouses as they transition from active worker into retirement. Data collection through in-home, face-to-face interviews began in 1992 with a panel of 12,654 participants, with subsequent telephone re-interviews every two years thereafter.⁸ The AHEAD study was designed as a supplementary sample to the HRS to examine health, family, and economic variables in the post-retirement period and at the end of life. The first wave of AHEAD began in 1993 with a sample of 8,222 participants, who were selected from the same nationally representative sample of U.S. households as the original HRS, but by selecting participants who were born in 1923 or before. Blacks, Hispanics,

and Florida residents were also oversampled in the AHEAD study.⁹ HRS and AHEAD both contain detailed information on demographics, health status, housing, family structure, employment, work history, disability, retirement plans, net worth, income, and health and life insurance. More detailed information on the design of the AHEAD and HRS surveys can be found on the data's website.¹⁰

Wave 2 of AHEAD (1995) and Wave 3 of the HRS (1996) included a set of experimental questions that were asked to 605 and 556 randomly-selected respondents of each study, respectively. Respondents listened to a vignette that asked them to consider the treatment choice for a hypothetical married woman in her eighties of unspecified race or ethnicity with a life-threatening form of cancer. Respondents were told that this woman would die within a few months if she did not undergo a treatment plan that could delay the spread of cancer. The treatment would make her dependent on personal care help during the treatment period. The treatment's probability of success was either low or high (20% or 60%), and the out-of-pocket treatment costs were also either low (with Medicare covering the costs) or high (with near depletion of household savings because Medicare would not cover the costs). All four combinations of success probabilities (low vs. high) and out-of-pocket costs (low vs. high) were presented in four different vignettes to the respondents. (The vignettes are reproduced at the bottom of Table 2; the vignettes and questions were identical in both the HRS and AHEAD studies.) Each respondent was randomly assigned to one of four groups. Every group received the same four vignettes, except the sequence with which the vignettes were presented was randomized by groups. Randomization of the vignette sequence was done because ordering effects could affect responses due to, for example, starting point bias or framing.¹¹

Statistical Analysis

We employed nonparametric statistical tests in our bivariate comparisons. We used the within-group Wilcoxon signed rank test to test for whether the respondent's opinion changed - on whether the hypothetical married woman should accept or reject the various treatment options - when different survival probabilities and financing mechanisms were presented in the four vignettes. To test for whether the distribution of the respondent's choices to the same vignette differed between groups of respondents (who were presented with different sequences of the vignettes), we used the Kruskal-Wallis test to compare between groups.¹²

We also analyzed the determinants of the respondent's propensity to recommend for or against the treatment options by using *ordered* logistic regressions. The dependent variables are the *thresholds* of survival probability or of financing options, or changes in these thresholds that the treatment would have to reach before the respondents would agree to recommend that the woman in the vignette accept treatment. These thresholds or cutoff values in the ordered logistic regressions come from the probabilities and financing options specified in the vignettes, and are noted at the bottom of Table 4 and described in detail in the results section for that table. The explanatory variables included the respondent's age, education, and net household wealth as continuous variables, and marital status, gender, race or ethnicity, health status, health status of the spouse if married, past experience with cancer, and religion as dummy variables. Because the HRS and the AHEAD subsamples come from different cohorts that may have differing viewpoints (in addition to age), we included a dummy indicator for the AHEAD cohort. We also included dummy variables for the randomized sequence groups to examine whether the order in which the four vignettes were presented was related to the respondents' opinions.

RESULTS

From the original 1161 respondents that were randomized into the cancer treatment experimental module, we excluded 18 that had missing values for our core set of explanatory variables, leaving us with 1143 observations (with 554 from HRS and 589 from AHEAD). No

respondent was excluded based on answers to the cancer treatment experimental module because everyone assigned to the module gave some form of response to these questions. Descriptive statistics of the sample are shown in Table 1. There were no significant differences in demographic and socioeconomic characteristics across the four randomized sequence groups (evaluated using chi-square tests not shown in the table).

To simplify our discussion below, the verbatim transcripts of the four vignettes are reproduced at the bottom of Table 2. Although most respondents gave answers of “yes” or “no” to the vignettes, some respondents answered “don’t know” or “depends” or “refused to answer” some of the vignettes. About 9% of respondents gave these other-than-yes-or-no answers for vignette S60, and such answers were slightly less prevalent for the other vignettes, with 6.9%, 7.4%, and 6.5% for vignettes M20, M60, and S20, respectively. For the subsequent analyses, we decided to collapse these other answers with the “no” answer while keeping “yes” as a separate category for three reasons: (i) because our main research question (“whether people should forego care to prevent impoverishment”) required the combined information from multiple vignettes, modeling these other answers as separate choices would quickly explode the number of parameters in a multinomial logit, making interpretation of results exceedingly complex; (ii) although there are no tests available¹³ for whether categories could be combined in an *ordered* logistic regression model (a model that we use to capture the natural order of survival probabilities or of financing options in the combined vignettes), we ran multinomial logits using each vignette individually, and the likelihood ratio tests¹⁴ of whether these other answers could be combined with either “yes” or “no” answers rejected the null for combining with “yes” in four out of four vignettes (p-values from <0.0001 to 0.03) and failed to reject the null for combining with “no” for vignettes S60 and M60 (although S20 and M20 were rejected at p-values less than 0.05); and (iii) regardless of whether we combined these other answers with “no” or with “yes” answers, our main results and conclusions do not change.

The top panel of Table 2 summarizes the decisions made by the respondents in the four different groups. Each group had a different sequence of how the treatment vignettes were presented, with the four possible combinations of financing source (Medicare vs. savings) and treatment success (20% vs. 60%) making up the four groups. Column 1 presents the codes we used for each of the four possible vignettes to indicate the financing mechanism (Column 2) and the survival probability (Column 3). In Column 1, “M” denotes Medicare financed, “S” denotes savings financed, “20” denotes 20% treatment success, and “60” denotes 60% treatment success.

Column 4 presents the acceptance rates for the four treatment vignettes as recommended by the full sample. The rankings of the percentages of respondents in favor of treatment for the four vignettes were consistent with a priori expectations. The percentage of respondents that would recommend accepting S20, the vignette when the treatment had to be financed out of the patient’s own savings and had only a 20% survival chance, was far lower than the percentage that would favor M60, the vignette where the treatment was financed by Medicare and the survival chance was 60%, with the acceptance rates for the other two vignettes falling between the two extremes.

Columns 5 to 8 in Table 2 report the percentage of respondents who agreed that the married woman in the vignette should undergo cancer treatment, tabulated by vignette and by group. The ordering in which the vignettes were presented to the respondents is indicated by the number inside the brackets in Table 2. For instance, Group 2 received the vignettes in the sequence of M60, M20, S60, and S20, and Group 3 received S20, S60, M20, and M60. As a very rough approximation, Group 2 respondents received vignettes in a descending order of potential value, and Group 3 received vignettes in an ascending order of potential value.

The acceptance rate for the various vignettes differed across the groups, reaching statistical significance for three out of the four vignettes (Column 9). Because the respondents were randomized into the four groups, this significant difference across groups suggests that the recommendation to accept or reject the hypothetical treatment was related to the sequence with which the vignettes were presented.

The four vignettes varied on two dimensions: financing and survival probability. Because the respondents were given discrete choices (yes or no) to the treatment in the vignettes, we do not observe the true underlying latent variables that form the decision basis for the respondents. Instead, we observe the various cut off points that actually could serve as bounds (or thresholds) for the latent variables. The cut off points for financing are near depletion of the patient's savings vs. low financial cost, and for survival, 20% and 60%. Under the two vignettes when Medicare covers the treatment costs, the financing variable is fixed (low financial cost) but the survival probability variable is varied. Therefore, *conditional on Medicare paying for the treatment*, the respondents' recommendations under the two survival probabilities essentially reflect the respondents' latent "reservation" survival probability or, equivalently, the minimum survival probability the respondents feel that the treatment must provide the patient in order for the respondents to recommend that the patient accept the treatment. When the respondents recommend accepting treatment at 20% survival probability, the respondents' reservation survival probability is less than or equal to 20%; when the respondents reject treatment at 20% but accept when survival is 60%, the respondents' reservation survival probability is between 20% and 60%. These are depicted in Table 3. Column 0 tabulates the possible decisions when survival probability changes from 20% to 60% but *conditional on financing by Medicare*. Conditional on Medicare paying for the costs, respondents could recommend to (i) accept treatment with 20% or 60% survival probability (coded M20=1; M60=1), (ii) reject the treatment with 20% but accept the treatment with 60% survival (coded M20=0; M60=1), or (iii) reject treatment even with a 60% survival (coded M20=0; M60=0). The first kind of respondents has a latent reservation survival probability for the patient (*conditional on Medicare coverage*) that is less than 20%, because they would recommend that the patient accept treatment with a 20% survival. The second kind of respondents has a latent reservation survival probability for the patient between 20% and 60%. The third kind of respondents has a latent reservation survival probability for the patient that is higher than 60%, because they would recommend that the patient reject the treatment even when it offered 60% survival for the patient.

Similarly, Columns 1, 2, and 3 in Table 3 present the possible acceptance/rejection recommendations under varying survival probability but *conditional on financing by the patient's own savings*. Conditional on having the patient pay for the treatment out of her household savings, respondents could recommend to (i) accept treatment when it has a 20% survival probability (coded S20=1; S60=1), (ii) reject if the treatment has 20% survival but accept if it has 60% survival (coded S20=0; S60=1), or (iii) reject even when the treatment has 60% survival (coded S20=0; S60=0).

The cells in Table 3 present the number and percentage of respondents who gave the various treatment recommendations under different survival probabilities - and conditional on the treatment being financed either by Medicare or by the patient's own savings. The superscript letters in the cells denote the respondents' choices to the four vignettes, as explained in the note at the bottom of the table. When Medicare covers for the treatment costs, a total of 424 respondents have a less than 20% reservation survival probability for the patient (shown in Row 1 or Cells a, b, and d of Table 3). They would recommend that the patient accept the treatment when survival is 20%. However, when treatment has to be financed by the patient's own savings, these same respondents' reservation survival probability for the patient shifts higher, so that some respondents require the treatment to have a higher survival probability

before they would recommend that the patient in the vignette accept the treatment. Thus, when the patient had to pay for the treatment, 303 respondents (Cell a) still had a reservation survival probability for the patient of less than 20%, 62 respondents (Cell b) required a higher reservation survival probability of between 20% to 60%, and 59 respondents (Cell d) had a reservation survival probability greater than 60%. Similarly, when Medicare covers the costs, a total of 239 respondents had a reservation survival probability between 20% to 60% (in Row 2 or Cells c and e of Table 3). However, when the treatment costs had to be covered by the patient's own savings, 122 out of the original 239 respondents would recommend rejecting treatment with a 60% survival, suggesting that their reservation survival probability for the patient was higher than 60%. Therefore, when financing changed from Medicare to the patient's own savings, respondents in Cells a, c, and f would continue to recommend the same treatment, but respondents in Cells b, d, and e would recommend rejecting the same treatment, because such treatment no longer met their higher reservation survival probability for the patient. Thus, a total of 243 or 21% of the respondents rejected the same treatment when financing changed from Medicare to savings-depletion.

Table 4 presents the minimum level of patient wealth that the respondent feels the patient must retain in order to recommend that the patient accept the treatment, *conditional on survival probability*. In Column 0, *conditional on 60% survival*, the respondents could recommend to (i) accept treatment when it is financed by the patient's own savings, (ii) reject treatment when savings-financed but accept if Medicare-financed, or (iii) reject treatment even when Medicare financed. The first type of respondents has a very low reservation wealth for the patient, since they would rather see that the patient deplete savings and opt for the treatment at 60% survival than to have the patient maintain her current wealth but receive no treatment. The second type has a reservation wealth level for the patient that is between asset depletion and the patient's current wealth. The third type has a reservation wealth level for the patient that is more than the patient's current wealth; these respondents feel that the patient must be *paid* before the respondents would recommend that the patient accept treatment with a 60% survival probability. The cells in Table 4 tabulate the number and percentages of respondents that fall into each of the three latent reservation wealth levels, but conditioning on 20% or 60% survival.

In order to find out the covariates that are related to the latent reservation survival or wealth levels, we performed a series of ordered logistic regressions using the survival or wealth latent variable as the dependent variable and various sociodemographic and health variables as explanatory variables. The results are shown in Table 4.

The dependent variables for Columns 2 through 5 are the reservation thresholds. In Columns 2 and 3, for instance, the dependent variables are the reservation survival probability thresholds, with cutoffs at 20% and 60%, conditional on, respectively, Medicare financing and patient savings financing. Columns 4 and 5's dependent variables consist of the reservation wealth thresholds, with cutoffs at patient savings depletion and the patient's current wealth, conditional on, respectively, 60% and 20% survival. For all the reservation thresholds, male and black respondents stood out as having a much lower odds of having a high reservation threshold for the patient, suggesting that they had low reservation levels for both the survival and wealth variables. In other words, they are more likely to recommend that the patient accept treatment, regardless of survival probability or financing source. Under Medicare financing (Column 2), married respondents (whose spouses were not in poor health) were more likely than those not married to recommend that the patient accept treatment, although such a differential effect was not significant when the treatment entailed depletion of the patient's savings (Column 3). The respondent's health or prior history of cancer did not seem to matter in the treatment recommendations; however, married respondents with spouses in poor health were far more likely to recommend accepting treatment than those who were married but whose spouses were not in poor health.¹⁵ Respondent's age, household wealth, education, and

religion did not seem to matter. The AHEAD dummy variable was also insignificant, including in separate regressions without the age variable (not reported in the table).

The respondent's sequence group was also included as dummy variables to control for the effect from vignette ordering, with Group 2 as the reference. Group 2 was the one where the vignettes were presented in a sequence suggestive of decreasing potential value (M60, M20, S60, S20). Conditional on financing, Group 2's vignette sequence suggested a loss in survival (going from 60% to 20%, under each financing scheme). Conditional on financing, Groups 1 and 3 both had a sequence of vignettes that were increasing in survival. Under Medicare financing (Column 2), Group 1 and Group 3 had lower reservation survival probability than Group 2 at $p < 0.01$ and $p < 0.10$, respectively, indicating that the respondents who experienced a sequential loss in survival (Group 2) needed a higher survival probability to "compensate" for the loss *more than* the respondents who experienced a sequential gain in survival (Groups 1 and 3). Conditional on savings-financed care (Column 3), Groups 1 continued to have a lower reservation survival probability threshold than Group 2. Under savings-financing (Column 3), Group 4 had a higher reservation survival probability than Group 2, probably because the sequential loss in survival probability was more salient in Group 4 (which had savings-financing presented before Medicare-financing). The S60 and S20 vignettes were presented to Group 2 respondents after they had received the first set of vignettes that included Medicare coverage. Therefore, there is some evidence of an ordering effect that is related to the sequence with which the vignettes were presented. Our simple dummy variable for Group, however, limits our ability to explain more fully the underlying reasons for the ordering effect.

One question we set out to answer was whether people would recommend as part of health policy that the hypothetical woman in the vignettes forego cancer treatment that potentially entailed impoverishing herself or her spouse. A corollary question, then, is whether those who recommended that the patient accept treatment under Medicare financing would recommend that the patient forego treatment when the treatment had to be financed by the patient's own savings. The answer is a resounding yes, among many of the respondents. This is depicted in Table 3, where the respondents are classified into different cells of the table with different superscript letters, based on whether they would recommend accepting or rejecting treatment with different financing and survival (as defined in the note at the bottom of Table 3). Respondents in the cells along the diagonal did not change their recommendation when financing changed from Medicare to the patient's own savings. Respondents off the diagonal, however, changed their recommendations when financing changed from Medicare to the patient's savings. Those in Cell b recommended that the patient accept treatment with a 20% survival when it was Medicare-financed, but recommended that the patient reject treatment when it had the same 20% survival but had to be financed by the patient's savings; under patient savings financing, these same respondents recommended that the patient accept the treatment when the survival was higher at 60%. Respondents in Cell d recommended the treatment with 20% survival when Medicare-financed, but rejected treatment even with 60% survival when patient savings-financed. Respondents in Cell e rejected treatment at 20% survival even when it was Medicare-financed, accepted it when survival was 60% and Medicare-financed, but rejected it when the treatment had 60% survival but had to be self-financed by the patient. Therefore, respondents in the off-diagonal cells (b, d, and e) switched their recommendations when financing changed from Medicare to the patient's own savings.

One relevant question is who would be more likely to switch recommendations when the financing switched from Medicare to the patient's own savings. Column 6 in Table 4 shows the results from an ordered logistic regression of the determinants of the *changes* in the respondent's reservation survival probability thresholds when financing changed from Medicare to the patient's own savings (having controlled for baseline choice). Column 6 compares those who switched treatment recommendations (thus implying a shift in reservation

survival probability thresholds when financing switched from Medicare to the patient's own savings) with those who did not switch - by comparing the characteristics of respondents who fall into Cells b, c, and e vs. those in Cells a and d of Table 3. Because the respondents in Cell f of Table 3 already recommended that the patient reject treatment under Medicare and were not able to switch their answers when the financing switched to the patient's own savings, we deleted these respondents in the regression. Further, because respondents in Rows 2 and 3 of Table 3 differed in their baseline reservation thresholds (and thus their recommendations) under Medicare financing, we included a dummy variable "accept 20% survival with Medicare financing" to the regression in Column 6 of Table 4.

The results of this regression show that male and black respondents were far less likely to switch treatment recommendations even if it meant depleting the patient's own savings. Interestingly, Hispanic respondents were far more likely to change their minds (than whites and blacks) and to recommend that the patient opt out of treatment when financing for the treatment changed from Medicare to the patient's own savings. Respondents in the AHEAD cohort were more likely to opt out as well, having controlled for age. Finally, marital status, health status, spouse's health status, cancer history, education, and household wealth were not significant determinants of switches in treatment recommendations when financing changed from Medicare to the patient's savings.

Because ordered logistic regression models make the proportional odds assumption,¹⁶ we tested and corrected for this violation with a series of ordered logistic regressions using *partial* proportional odds models. The variables that differed significantly between proportional odds and partial proportional odds models are presented at the bottom panel of Table 4. Our main findings do not change with the less restrictive partial proportional odds models. In fact, the only difference in the odds ratios pertains to the size rather than the direction of the effect. The only nontrivial size difference was the odds of Hispanics switching from accepting to rejecting treatment when financing changed from Medicare to patient savings (Column 6 of Table 4), with the original odds ratio of 2.79 (from the proportional odds model) increasing to 5.46 (with the partial proportional odds model); this reflects the fact that most Hispanics who recommended accepting Medicare-financed treatment at 20% survival switched to rejecting the treatment even at 60% survival when the treatment had to be financed by the patient's savings.

DISCUSSION

With a unique data set that included elderly and near-elderly respondents in the U.S. and their answers to a set of vignettes about end-of-life health care treatment decisions on behalf of a hypothetical elderly woman, we explored how elderly and near elderly adults assess EOL medical treatment choices with varying probabilities of success and with substantially different financial implications. Before we discuss some of the main results and implications, we shall first highlight the limitations of our study, so that the results could be interpreted in light of these limitations.

Our study suffers from two main limitations. First, the respondents were asked about their opinion on cancer treatment choices for an anonymous, *hypothetical* woman in her 80's of unknown race or ethnicity. While the answers should reflect the respondents' health policy choices, it is unclear whether some respondents also answered these vignettes taking the perspective of making the treatment choices for themselves or their spouse, rather than for a hypothetical person. Decisions based on the respondent's own life versus that of a hypothetical person will likely depend on the emotional context, financial status, or other personal factors. We have controlled for some of these effects by including a set of demographic covariates, but

our statistical analyses have not fully accounted for all the factors related to actual versus hypothetical answers that would bias our results.

Another important limitation to our study is that the respondents may have had difficulty in fully understanding the rather complex vignettes used to collect the data. For instance, the vignettes used 20% and 60% as survival probabilities, and some respondents may have had trouble interpreting probabilities. The way the vignettes were presented to the respondents also does not necessarily reflect how physicians normally convey information for treatment choices. In fact, physicians do not have uniform methods of presenting outcomes and uncertainty. Differences in the framing of outcomes (survival vs. mortality, for instance) and the level of uncertainty (relative risk reduction, number of people needed to treat, probabilities) have both been shown to result in different treatment choices.¹⁷ Although the literature recommends presenting information using multiple modalities, using charts, graphs, and simple heuristics (such as using 1-in-10 instead of 10% probability), there is no consensus about how best to present these kinds of information even during the “informed consent” process.¹⁸ Clearly, more research is needed in this important part of physician-patient clinical decision making, especially when physicians themselves are also influenced by framing and the way risk and uncertainty are presented.¹⁹

In view of these limitations, our study does have some interesting although sometimes perplexing findings. We found that many respondents would recommend foregoing costly EOL treatments for a hypothetical woman in a set of vignettes, when the treatment cost would wipe out the patient’s savings. Among the total of 663 respondents that would recommend opting for care when it was financed by Medicare (Cells a, b, c, d, and e in Table 3), 243 (or 36.7% of them; Cells b, d, and e in Table 3) would not recommend accepting the same treatment if the woman in the vignette had to deplete savings to pay for the treatment. These numbers indicate that when treatment cost is not covered by Medicare, the respondents feel that the patient must be “compensated” with a higher treatment survival probability for them to recommend accepting treatment. Viewing this from an alternative angle, when treatment cost is covered by Medicare, respondents would recommend opting for care that had even a low survival probability. This latter phenomenon is the well-studied and well-documented moral hazard,²⁰ which essentially says that people will consume more care when the out of pocket cost is low.

While it seems self-evident that people would be more likely to recommend opting for treatment if the patient’s out-of-pocket costs were low, it is interesting that many of the respondents would recommend against treatment even when it entailed a low financial cost to the patient (e.g., respondents in Cell f in table 3). This may reflect concerns about various direct, indirect, and intangible costs related to the treatment. The vignettes state that Medicare will pay *most* of the costs and, as such, respondents may believe that the patient’s out-of-pocket costs would still be significant even under the Medicare financing option because it does not cover *all* of the costs. The vignettes also indicated that the subject “would have to rely on others for personal care during the treatment.” Non-monetary costs associated with caregiving and the monetary costs of hiring a caregiver may be important in actual treatment decisions.²¹ In addition to these direct medical and non-medical costs, there is also the pain and suffering associated with the treatment. However, it is difficult to assess how these costs induced any type of response bias. For instance, in terms of the pain and suffering, respondents with a history of cancer did not differ in their recommendations than those who have never had cancer (see Table 4).

Our study also found that black respondents were far more likely to recommend opting for treatment regardless of survival probability or payment source, a finding consistent with many prior studies.²² White respondents were more likely to recommend opting out of care if that care meant depletion of the patient’s savings. Interestingly, Hispanics were even more likely

than whites to recommend opting out of such care; their treatment recommendations were the most sensitive to change in how the treatment would be financed. This finding needs to be further explored in other datasets, because as far as we know, this has not been documented in the literature.

We also found that females were far more likely than males to switch out of treatment that they had recommended accepting under Medicare financing but now had to be paid out of the patient's pocket. In separate regressions stratified by marital status (not reported in the tables), this gender differential was significant only among married respondents; i.e., married women were much more likely to recommend switching out of treatment when Medicare no longer paid, but women that were not married were not significantly more likely than unmarried men to recommend switching out of treatment. Many reasons are possible why there is this strong gender differential in recommendations. The vignettes asked about an elderly married woman with a threatening form of cancer needing treatment, and it is possible that the respondents were more altruistic than selfish: married male respondents might have identified more with the husband in the vignettes and felt that the wife should get care even if it meant impoverishing the patient's husband, but married female respondents might have identified more with the woman in the vignette and felt that the patient herself should forego care to prevent impoverishing her spouse. Willingness-to-pay studies among couples where one spouse has mild to moderate dementia and the other spouse is a caretaker have found evidence of altruism motives between the dyad.²³ One way to further study this treatment recommender vs. treatment recipient gender effect would be to randomize the gender of the cancer patient in the hypothetical vignettes in future research. Another possible reason for the gender differential is that men might be more aggressive than women in opting for medical treatments, as in treatments for coronary artery disease.²⁴ In regressions not reported in the tables, we included a proxy for risk aversion for the HRS subsample, but it was not significant in any of the regressions, suggesting that any aggressiveness in opting for treatment among men was not due to risk tolerance. Despite our inability to test for the various reasons for this gender differential, further research is needed on this issue, since it could have important welfare and policy implications. Given that women and men differed in their recommendations in these vignettes, the use of spouses as durable powers of attorney to make EOL care decisions should be further examined, since women and men clearly had different preferences. This is an additional piece of evidence that discordant decisions could be likely even with advance directives.²⁵

Finally, we found that the order in which the various treatment options were presented had an effect on the recommendation of uptake for the treatment. The ordering effect could be due to starting point bias in that the respondents latched onto their first answer as the framework to answer the subsequent vignettes. The respondents could also have been affected by framing. Each vignette was framed with both gain and loss: the survival probability was framed as a gain and the financing was framed as a loss. Prior research has found that framing had an impact on patient's decisions.¹¹ Moreover, in going from one vignette to the next, the sequence of vignettes was presented as gains, losses, or some combination of the two. Prior studies have documented ordering effects in willingness-to-pay for medical care for the public, but starting point bias and framing were found not to be dominant explanations.²⁶ The vignettes in our data were much more personal and asked the respondents to make a specific treatment choice for a woman in the vignette. Some of our findings do suggest that framing (in terms of whether the sequence of vignettes was presented as losses or gains across the vignettes) was a potential explanation for some of the ordering effect. The complexity of the vignettes and of their sequences of presentation, however, prevented us from further exploring the reasons for the ordering effect. Nevertheless, future research on ordering effects and their clinical relevance is warranted.

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REFERENCES

1. DeNavas-Walt, C.; Proctor, BD.; Lee, CH. Income, poverty, and health insurance coverage in the United States: 2005. U.S. Government Printing Office; Washington, DC: 2006. U.S. Census Bureau, Current Population Reports, P60-231
2. McGarry K, Schoeni RF. Widow(er) poverty and out-of-pocket medical expenditures near the end of life. *J Gerontol B Psychol Sci Soc Sci May*;2005 60(3):S160–8. [PubMed: 15860793]
3. Fan JX, Zick CD. The economic burden of health care, funeral, and burial expenditures at the end of life. *J Consum Aff* 2004;38:35–55.
4. Zick CD, Fan JX, Chang K. Impending widowhood and health care spending. *Soc Sci Res* 2004;33:538–55.
5. Morrison RS. Health care system factors affecting end-of-life care. *J Palliat Med* 2005;8(Suppl 1):S79–87. [PubMed: 16499472]
6. Rabow MW, Hauser JM, Adams J. Supporting family caregivers at the end of life: “they don’t know what they don’t know”. *JAMA* Jan 28;2004 291(4):483–91. [PubMed: 14747506]
7. Schulz R, Beach SR. Caregiving as a risk factor for mortality: the Caregiver Health Effects Study. *JAMA* Dec 15;1999 282(23):2215–9. [PubMed: 10605972]
8. Heeringa, SG.; Connor, JH. Technical Description of the Health and Retirement Survey Sample Design. Institute for Social Research, University of Michigan; Ann Arbor, MI: May. 1995
9. Heeringa, SG. Technical Description of the Asset and Health Dynamics (AHEAD) Survey Sample Design. Institute for Social Research, University of Michigan; Ann Arbor, MI: Oct. 1995
10. Health and Retirement Study. 1995 AHEAD and 1996 HRS, public use dataset. Produced and distributed by the University of Michigan with funding from the National Institute on Aging; Ann Arbor, MI: 1996 [accessed on 7 March, 2007]. grant number NIA U01AG0097401995<http://hrsonline.isr.umich.edu>
11. Armstrong K, Schwartz JS, Fitzgerald G, Putt M, Ubel PA. Effect of framing as gain versus loss on understanding and hypothetical treatment choices: Survival and mortality curves. *Medical Decision Making* 2002;22:76–83. [PubMed: 11833668]
12. Lehmann, EL. Nonparametrics: Statistical methods based on ranks. Holden-Day; San Francisco: 1975.
13. Franses, PH.; Cramer, M. On the number of categories in an ordered regression model. Erasmus University Rotterdam Econometric Institute Report 2002-15. <http://www2.eur.nl/WebDOC/doc/econometrie/feweco20020501105232.pdf>
14. Cramer JS, Ridder G. Pooling states in the multinomial logit model. *Journal of Econometrics*. 1991 47:267–272.
15. Ai C, Norton EC. Interaction terms in logit and probit models. *Economics Letters* 2003;80:123–129.
16. Stokes, ME.; Davis, CS.; Koch, GG. Categorical Data Analysis Using the SAS System. 2nd ed.. SAS Publishing, BBU Press and John Wiley Sons Inc.; Cary, NC: 2000. p. 533-541.
17. Wills CE, Holmes-Rovner M. Patient comprehension of information for shared treatment decision making: state of the art and future directions. *Patient Education and Counseling* 2003;50:285–290. [PubMed: 12900101]
18. Moxey A, O’Connell D, McGettigan P, Henry D. Describing treatment effects to patients: How they are expressed makes a difference. *Journal of General Internal Medicine* 2003;18:948–959. [PubMed: 14687282]
19. McGettigan P, Sly K, O’Connell D, Hill S, Henry D. The effects of information framing on the practices of physicians. *Journal of General Internal Medicine* 1999;14:633–642. [PubMed: 10571710]

20. Pauly MV. The economics of moral hazard: comment. *American Economic Review* 1968;58:531–537.
21. Byock IR. End-of-life care: a public health crisis and an opportunity for managed care. *Am J Manag Care* 2001;7:1123–32. [PubMed: 11767298]
22. Searight HR, Gafford J. Cultural diversity at the end of life: Issues and guidelines for family physicians. *American Family Physician* 2005;71:515–522. [PubMed: 15712625]
23. König, M.; Zweifel, P. Willingness-to-pay against dementia: Effects of altruism between patients and their spouse caregivers. University of Zurich Working Paper; Sep. 2004
24. Heidenreich PA, Shlipak MG, Geppert J, McClellan M. Racial and sex differences in refusal of coronary angiography. *The American Journal of Medicine* August 15;2002 113(3):200–207. [PubMed: 12208378]
25. Fagerlin A, Ditto PH, Hawkins NA, Schneider CE, Smucker WD. The use of advance directives in end-of-life decision making. *American Behavioral Scientist* 2002;46(2):268–283.
26. Stewart JM, O'Shea E, Donaldson C, Shackley P. Do ordering effects matter in willingness-to-pay studies of health care? *Journal of Health Economics* 2002;21:585–599. [PubMed: 12146592]

Table 1**Descriptive Statistics of the Sample**

Variable	Mean or Percentage
Male (%)	38.50
Non-Hispanic white/other (%)	85.30
Non-Hispanic black (%)	12.07
Hispanic (%)	2.62
Married (%)	68.15
Respondent in Poor/Fair Health (%)	23.27
Spouse in Poor/Fair Health (% among those married)	23.62
Respondent Has/Had Cancer (%)	12.51
Protestant Religion (%)	68.85
Catholic Religion (%)	22.13
AHEAD Cohort (%)	51.53
Age (years)	68.25
Education (years)	12.26
Household Wealth (US\$100,000)	2.99
Sample Size	1143

Table 2
Percentage Agreeing to Hypothetical Cancer Treatment, Grouped by Vignette Sequence

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Vignettes	Financing Mechanism	Survival Probability	Full Sample	Group by Sequence of Vignettes				p-value Difference across Groups
				Group 1	Group 2	Group 3	Group 4	
M20	Medicare	20%	37.10	44.98 [1]	33.94 [2]	39.79 [3]	29.51 [4]	0.001
M60	Medicare	60%	58.01	62.63 [2]	54.87 [1]	60.90 [4]	53.47 [3]	0.070
S20	Savings	20%	26.51	32.18 [3]	25.62 [4]	27.68 [1]	20.49 [2]	0.015
S60	Savings	60%	42.17	47.06 [4]	41.16 [3]	47.06 [2]	33.33 [1]	0.002
Percentage of Sample			100	25.28	24.23	25.28	25.20	

Note: Number in brackets denotes the sequence of vignettes for each group; p-value by Kruskal-Wallis test

Descriptions of Vignettes:

M20: “Now I’d like to describe a specific situation and get your opinion about it. Here is the situation: A married woman in her 80s is told by her doctor that she has a life-threatening form of cancer. The doctor tells her that without any treatment she is likely to die within the next few months. He describes a 4-month treatment plan aimed at delaying the spread of the cancer. The treatment itself would make her fairly uncomfortable, and she would have to rely on others for personal care during the treatment. The treatment costs are fairly high but Medicare will pay most of the costs. The doctor tells her that, with the treatment, she stands a 20% chance of living 2 or 3 good years after completing the treatment. Do you think she should agree to the treatment?”

M60: “What if the doctor had, instead, told her that with the treatment, she stood a 60% chance of living 2 or 3 good years? Do you think she should agree to the treatment then?”

S20: “Now let’s say the situation is a bit different. The same woman faces the same decision whether to agree to the same 4-month treatment for her cancer, but this time instead of Medicare paying most of the costs, she and her husband will have to pay most of the costs. They could afford to do so but it would take almost all of their savings. The doctor tells her that, with the treatment, she stands a 20% chance of living 2 or 3 good years after completing the treatment. Do you think she should agree to the treatment?”

S60: “What if the doctor had, instead, told her that with the treatment, she stood a 60% chance of living 2 or 3 good years? Do you think she should agree to the treatment then?”

Table 3
Number (and Percentage) of Respondents, by Latent “Reservation” Survival Probability

Conditional on Financing by Medicare	Minimum Survival Probability Threshold Required before Recommending Accepting Treatment Conditional on Financing by Patient's Own Savings				Total by Row (4)
	(0)	less than 20% survival (S20=1; S60=1) (1)	20% to 60% survival (S20=0; S60=1) (2)	more than 60% survival (S20=0; S60=0) (3)	
(1) less than 20% survival (M20=1; M60=1)		303 (26.5%) ^d	62 (5.4%) ^b	59 (5.2%) ^d	424 (37.1%)
(2) 20% to 60% survival (M20=0; M60=1)		0	117 (10.2%) ^c	122 (10.7%) ^e	239 (20.9%)
(3) more than 60% survival (M20=0; M60=0)		0	0	480 (42.0%) ^f	480 (42.0%)
Total by Column		303 (26.5%)	179 (15.7%)	661 (57.8%)	1143 (100%)

NOTE: Superscripts in both tables denote the respondents’ accept/reject decisions for the four vignettes, with |=accept 0=reject as follows:

- ^a M20=1, M60=1, S20=1, S60=1
- ^b M20=1, M60=1, S20=0, S60=1
- ^c M20=0, M60=1, S20=0, S60=1
- ^d M20=1, M60=1, S20=0, S60=0
- ^e M20=0, M60=1, S20=0, S60=0
- ^f M20=0, M60=0, S20=0, S60=0

Table 4
Number (and Percentage) of Respondents, by Latent “Reservation” Wealth Level

	Minimum Wealth (or Financing) Threshold Required before Recommending Accepting Treatment		Conditional on 20% Survival		Total by Row (4)
	Conditional on 60% Survival		< savings depletion (s20=1; m20=1) (1)	savings depletion to current wealth (s20=0; m20=1) (2)	> current wealth (s20=0; m20=0) (3)
(0)					
(1) < savings depletion	(s60=1; m60=1)	303 (26.5%) ^d	62 (5.4%) ^b	117 (10.2%) ^c	482 (42.2%)
(2) savings depletion to current wealth	(s60=0; m60=1)	0	59 (5.2%) ^d	122 (10.7%) ^e	181 (15.8%)
(3) > current wealth	(s60=0; m60=0)	0	0	480 (42.0%) ^f	480 (42.0%)
Total by Column		303 (26.5%)	121 (10.6%)	719 (62.9%)	1143 (100%)

NOTE: Superscripts in both tables denote the respondents’ accept/reject decisions for the four vignettes, with 1=accept 0=reject as follows:

- ^a M20=1, M60=1, S20=1, S60=1
- ^b M20=1, M60=1, S20=0, S60=1
- ^c M20=0, M60=1, S20=0, S60=1
- ^d M20=1, M60=1, S20=0, S60=0
- ^e M20=0, M60=1, S20=0, S60=0
- ^f M20=0, M60=0, S20=0, S60=0

Adjusted Odds Ratios from Ordered Logistic Regressions

Table 5

Explanatory Variables (1)	Odds Ratios for Having a Higher Level of Reservation Threshold						Odds Ratios of an Increase in Reservation Threshold	
	Conditional on Financing by Medicare (2)			Conditional on Financing by Patient's Savings (3)			When Financing Changes from Medicare to Own Savings (6)	
	Odds Ratios	95% C.I.	Odds Ratios	Odds Ratios	95% C.I.	Odds Ratios	Odds Ratios	95% C.I.
Male	0.61	(0.48,0.78)**	0.53	0.56	(0.44,0.72)**	0.61	0.65	(0.46,0.92)*
Black	0.26	(0.18,0.38)**	0.24	0.27	(0.18,0.40)**	0.23	0.53	(0.31,0.90)*
Hispanic	0.71	(0.35,1.43)	1.25	1.01	(0.49,2.05)	0.74	2.79	(1.12,6.93)*
Married	0.75	(0.56,1.00)*	0.84	0.83	(0.62,1.11)	0.70	1.07	(0.70,1.63)
Respondent in poor/fair health	1.02	(0.77,1.34)	0.98	0.98	(0.74,1.30)	1.01	0.92	(0.61,1.39)
Spouse in poor/fair health	0.64	(0.47,0.89)**	0.67	0.72	(0.51,0.99)*	0.61	0.92	(0.59,1.44)
Respondent has/had cancer	1.22	(0.87,1.73)	1.22	1.24	(0.88,1.76)	1.17	1.19	(0.71,1.99)
Protestant	0.99	(0.67,1.48)	0.87	0.95	(0.63,1.41)	0.92	0.78	(0.45,1.35)
Catholic	0.86	(0.55,1.34)	0.75	0.86	(0.55,1.35)	0.76	0.90	(0.48,1.68)
AHEAD	0.78	(0.52,1.19)	1.06	0.87	(0.57,1.33)	0.96	2.10	(1.13,3.91)*
Age	1.00	(0.98,1.02)	0.99	1.00	(0.98,1.01)	0.99	0.97	(0.94,1.00)
Education	1.00	(0.96,1.05)	1.00	0.99	(0.95,1.03)	1.01	1.00	(0.94,1.06)
Household Wealth	1.00	(0.98,1.01)	1.00	0.99	(0.98,1.01)	1.00	1.00	(0.98,1.03)
Group 1	0.64	(0.46,0.87)**	0.71	0.71	(0.52,0.98)*	0.62	1.23	(0.77,1.98)
Group 3	0.75	(0.54,1.02)	0.79	0.76	(0.55,1.04)	0.79	1.16	(0.72,1.86)*
Group 4	1.17	(0.85,1.61)	1.50	1.27	(0.92,1.74)	1.36	1.78	(1.11,2.86)*
Accept 20% Survival with Medicare							0.60	(0.43,0.84)**
Sample Size	1143			1143		1143		663
Likelihood Ratio								
Chi-Square	99.17		108.01	89.95		110.33		50.77
df	16		16	16		16		17
p-level	<.0001		<.0001	<.0001		<.0001		<.0001
Adjusted R-Square	0.10		0.11	0.09		0.11		0.09
Test for Proportional Odds Assumption								
Chi-Square	23.75		27.74	21.26		20.16		144.36
df	16		16	16		16		17
p-level	0.10		0.03	0.17		0.21		<.0001
Variables in <i>partial</i> proportional odds model that are significantly different from those in the regular proportional odds model								
Group 4 (low/medium vs. high threshold)				1.13	(0.81,1.58)			
Group 4 (low vs. medium/high threshold)				1.46	(1.03,2.05)*			
AHEAD (low/medium vs. high threshold)	0.88	(0.57,1.34)	(no variables with					
AHEAD (low vs. medium/ high threshold)	0.70	(0.46,1.07)	P < 0.05)					
Hispanic (low/medium vs. high threshold)						0.55	5.46	(1.76,16.94)**
Hispanic (low vs. medium/ high threshold)						1.25	1.97	(0.74,5.24)

NOTE: The dependent variables for these ordered logistic regressions are the various reservation thresholds as bounded by the cutoffs in the vignettes and are coded as follows: For Columns 2 and 3: “reservation survival probability less than 20%” = 1; “reservation survival between 20% and 60%” = 2; “reservation survival above 60%” = 3. For Columns 4 and 5: “reservation wealth level less than savings depletion” = 1; “reservation wealth between savings depletion and current wealth” = 2; “reservation wealth > current wealth” = 3. For Column 6: “no shift in reservation survival” = 1; “shift from less than 20% to greater than 60%” = 2; “shift from less than 20% to greater than 60%” = 3.

* p<.05;
** p<.01